

## **Technology Leadership Preparedness: Principals' Perceptions**

Wendy Metcalf, Ed.D.  
Gwinnett County Public Schools, GA

Jason LaFrance, Ed.D.  
Georgia Southern University

### **Abstract**

Adopting technology in the K-12 classroom is evolving from adapting lessons that highlight a technology to pervasive use of interactive and handheld devices. In this environment, school leaders have the complex task of incorporating technologies to enhance teaching and learning. The purpose of this quasi-experimental quantitative study was to examine leaders' perceptions of technology leadership preparedness and analyze the impact of the Quality-Plus Leader Academy (QPLA) on leaders' perceptions. The research was guided by the overarching question: What is the perceived technology leadership preparedness level of school administrators as measured by their understanding of the 2009 ISTE NETS-A standards? The following sub-question added clarity: How do technology leadership preparedness perceptions differ between principals who attended the Quality-Plus Leader Academy and those who did not, across the five NETS-A themes: visionary leadership, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship? This study revealed principals' perceived they were most prepared for digital citizenship and least prepared for visionary leadership. In addition, there was a statistically significant difference between technology leadership preparedness perceptions between QPLA participants and non-QPLA participants. Considering these findings we recommend that Educational Leadership programs align coursework with NETS-A standards to help leaders develop the knowledge and skills necessary to lead technology rich schools. In addition, school districts should consider using supplemental principal preparation programs that incorporate the NETS-A standards to further prepare their building leaders. Technology leadership skills should be embedded in the standard dimensions of leader development.

John Dewey stated, "If we teach today as we taught yesterday, we rob our children of tomorrow." School leaders must embrace this philosophy and engage in activities which prepare them to lead 21<sup>st</sup> century schools. Increasingly, this involves developing an understanding that technology in the K-12 classroom is evolving from adapting lessons that highlight a technology to pervasive use of interactive and handheld

devices. This instruction-technology connection creates high expectations to engage today's learners and transform education to support 21<sup>st</sup> century skills. In this environment, school leaders have the complex task of incorporating technologies to enhance teaching and learning. In addition, researchers note that today's students have grown up immersed in technology and some schools are responding to this demand by providing more engaging and collaborative technologies for students and staff (Gosmire & Grady, 2007; Prensky, 2010). However, some school leaders have not been prepared to support ever-changing technology-rich environments (Bush, 2008; Levin, 2005).

In an effort to provide guidance for leaders, the International Society of Technology Education developed educational technology standards, called NETS-A (ISTE, 2009). The purpose of this quasi-experimental, quantitative study was to explore the perceptions school principals have of their technology leadership preparedness and determine the impact of the Quality-Plus Leader Academy on leaders' perceptions of their technology leadership preparation. The district of study used a supplemental leader preparation program, Quality-Plus Leader Academy, to enhance traditional leader preparation. Technology leader preparation skills were defined by the 2009 NETS-A standards. This is important because understanding how leaders perceive their own skills and analyzing the impact of training will inform decision makers who provide training for school leaders.

## **Conceptual Framework**

In March 2010, the National Educational Technology Plan (NETP) focused on transforming education through effective use of engaging technology. It suggested successful implementation relies on strong leadership (United States Department of Education, 2010). In fact, researchers have suggested leadership is the best predictor of the effect of technology on teaching and learning (Anderson & Dexter, 2005; Reilly, 2005). Meanwhile, technology skills are scarcely addressed in formal educational leadership programs (Dexter, 2008; Redish & Chan, 2007). Having an understanding of the current technologies and how they can be utilized is critical because securing and allocating necessary financial resources for technology is one of the many responsibilities of a K-12 building leader. In addition, researchers have concluded that leadership is the most important factor in effective school change (Leithwood & Riehl, 2005), including change brought about by technology (Dexter, 2008; Gosmire & Grady, 2007; Grey-Bowen, 2010; Macaulay, 2009; Redish & Chan, 2007). Specifically, the principal's role in visionary leadership, modeling best practices, and support for instructional technology is key to successful technology integration (Gosmire & Grady 2007). To fulfill these roles, it is clear that technology leadership skills are needed and awareness of those skills is critical.

## **Technology Leadership Skills**

Researchers have attempted to identify the necessary skills for technology leadership (Anderson & Dexter, 2005; Davies, 2010; Grady, 2011). In 2005, Anderson and Dexter (2005) developed a model for technology leadership with eight technology leadership indicators: technology committee, school technology budget, district support, principal e-mail, principal days (on technology), staff development policy, grants, and intellectual property policies. Their study concluded that “although technology infrastructure is important, for educational technology to become an integral part of a school, technology leadership is even more necessary” (Anderson & Dexter, 2005, p. 74). More recently, Grady (2011) provided a list of 10 tasks for the principal’s role as technology leader. These include:

The principal should establish the vision and goals for technology in the school.

The principal should carry the technology banner in the school.

The principal should model use of technology.

The principal should support technology use in the school.

The principal should engage in professional development activities that focus on technology and integration of technology in student learning activities.

The principal should provide professional development opportunities for teachers and staff that emphasize use of technology and that facilitate integration of technology into student learning.

The principal should secure resources to support technology use and integration in the school.

The principal should be an advocate for technology use that supports student learning.

The principal should be knowledgeable and supportive of national technology standards and promote attainment of the standards in the school.

The principal should communicate the uses and importance of technology in enhancing student learning experiences to the school’s stakeholders.

Grady (2011) made a final note on the task list to remember that “technology is nothing more than a tool used to complete work” (p. 8). This task list, as well as the technology models by Anderson and Dexter (2005) and Davies (2010), provided guidance to principals for technology leadership skills. All three researchers support the development and use of nationally recognized technology leadership standards. The most prominent

and frequently used standards for administrators are the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS-A).

### **Standards for Technology Leadership**

In 2001, the International Society for Technology in Education (ISTE) developed educational technology standards for students and teachers, NETS-S and NETS-T, respectively. In 2002, ISTE developed technology standards for leaders, known as NETS-A which were updated in 2009 (ISTE, 2009). The rationale for NETS-A was that leaders must be able to support students and teachers and ensure that conditions essential to ensuring optimal benefits from technology are in place (Knezek, 2009). These standards were grouped by six subscales: leadership and vision; learning and teaching; productivity and professional practice; support, management, and operations; assessment and evaluation; and social, legal, and ethical issues. For each of the six subscales, performance indicators were added to further explain the theme (ISTE, 2009).

The visionary leadership subscale guides leaders to inspire a shared vision with stakeholders to maximize positive instructional change. A visionary leader is expected to advocate technology efforts by committing time and resources to support change (ISTE, 2009).

The digital citizenship subscale calls for leaders to ensure equitable access to technology resources. Digital citizenship expects leaders to promote, model, and establish policies that ensure safe, legal, and ethical use of technology. Responsible use of technology and social interactions in a digital environment are also expected (Knezek, 2009).

Systemic improvement emphasizes data-driven decision making. This subscale guides leaders to recruit and retain tech-savvy teachers and staff. Leaders should also support a technology infrastructure and partner with business for technology operations and support (Sykora, 2009).

Excellence in professional practice is the fourth NETS-A subscale. Leaders demonstrate this subscale by empowering teachers and ensuring time and resources for technology professional development. Leaders are expected to promote and model digital tools as well as remain current in technology research and trends (ISTE, 2009).

Digital age culture includes improving instruction through technology integration. Technology should be utilized to meet individual student needs. Leaders should model and promote effective use of technology while keeping up with local, national, and global innovations (Sykora, 2009). The standards reflect the pervasive role of technology in society and the need to prepare students for the 21<sup>st</sup> century.

Today's administrators need to have a strategic vision supported by technology to help tomorrow's students compete globally. These standards were "meant to inspire administrators to become 21<sup>st</sup> century leaders and provide guideposts to get there" (Sykora, 2007, p. 48) and provide a framework to inform leader preparation in the area of technology leadership (Knezek, 2009; Miller, 2008). Having reviewed the standards for successful technology leaders we reviewed the literature on leadership preparation.

### **Leadership Preparation**

It is widely accepted that school leadership has great influence on student outcomes (Leithwood & Riehl, 2005). Therefore, how principals are prepared for their role has never been more important. Most of today's school leaders came into their positions through a traditional education and certification process. The triad responsible for passage to administration starts with college or university leadership programs. Once completed, a state professional standards committee grants a leadership certificate. Finally, a school district hires for a leadership position (Mitgang, 2008; Young, 2010). Unfortunately, this traditional path is not leading to the preparation of leaders for today's schools (Schrump et al., 2011). This is supported by Levine (2005) and Hess and Kelly (2007) as they examined the environment and curriculum for traditional leader preparation. These researchers suggested that although the educational environment is quickly changing, leader preparation is not changing as fast. Due to this gap, there is a growing acceptance that leaders need on-going training to bridge between learning situations and work situations (Bush, 2008; Mitgang, 2008). Due to the mismatch of traditional leader preparation and daily activities, districts are creating their own programs to fill the gap (Bush, 2008; Levin, 2005; Mitgang, 2008; Young, 2010). One program where leaders are getting these skills is the Quality-Plus Leader Academy.

### **Quality-Plus Leader Academy**

The Quality-Plus Leader Academy (QPLA) is one of the member organizations of the Rainwater Leadership Alliance (RLA). This supplemental leader preparation program was developed in 2007 in response to one district's need to prepare future principals for 35 new schools opening between 2006 and 2011 in addition to other vacancies that would naturally occur. The goal of the academy is to "train and develop future school principals, with a curriculum created and developed by school system leaders" (Cheney, 2010, p. 131).

QPLA and the other RLA programs select one cohort of 25-30 aspiring leaders per year. Cohort applicants are identified within the district and recommended by their immediate supervisor as an aspiring leader. The selection process relies on multiple measures to get a complete picture of each candidate. The screening and selection process includes: interviews, simulated in-basket items, written reflections, and oral competency

evaluations. QPLA uses commercially produced leadership instruments such as Principal Insight, a Gallup Organization instrument, to identify some soft skills and adult leadership tendencies. Candidates also participate in a full-day diagnostic skills assessment process entitled “Selecting and Developing the 21<sup>st</sup> Century Leader,” developed by the National Association of Secondary School Principals.

Likewise, in order to provide a complete training program, multiple development opportunities make up QPLA. Coursework, residency, and coaching are the three training and development components. The first phase is a year-long series of practical sessions designed to support a principal’s daily tasks and activities. During this time aspiring principals experience in-depth training in the areas of human resources, budget, facilities, data management, and technology. These practical sessions are developed and conducted by system-level leaders. Because most of the QPLA participants are internal candidates in the leadership pipeline that are familiar with each other and grounded in the district culture (Cheney, 2010).

Several of the sessions include the NETS-A standards. However, one of the sessions specifically targets technology leadership and vision. Participants learn about digital citizenship and digital-age culture with activities that explore the impact of social media, federal internet regulations, and technology-infused quality instruction. Excellence in professional practice is instilled through data integrity, total-cost of ownership, and communication strategies. In all QPLA sessions, systemic improvement is addressed.

The second component of the Academy is participation in two 25-day residency experiences with successful principals. This residency experience is overseen by an experienced principal who serves as a mentor. Academy members may choose the school level for each of the residencies. During the residency, participants follow an individual plan that includes goals, targeted areas of growth, detailed rationale, and measurable results. Participants also submit a reflective summary of each residency.

Coaching is the third component of the QPLA program. Program graduates who are in a principal position are assigned a mentor for the first two years of a principalship. Mentors provide individual support for new leaders through “one-on-one meetings, small group support sessions, and just-in-time training on essential leadership topics” (Cheney, 2010, p. 195). One of the purposes of mentoring is to establish non-evaluative partnerships between new leaders and experienced leaders who have consistently demonstrated the characteristics of QPLA leaders.

Beyond the coursework, residencies, and coaching, Academy members receive ongoing support. When Academy members graduate, they participate in ongoing professional learning activities. These include a yearly Summer Leadership Conference, monthly leadership development sessions, and periodic initiative-specific training. Sample topics

and speakers for ongoing professional learning include quality-plus teaching strategies, continuous quality improvement, Dr. John Antoinetti, author of *The Engagement Cube: What's Engaging Today's Learners?* and Dr. Anthony Muhammad, author of *Transforming School Culture* (Cheney, 2010).

## **Summary**

The role of the principal has changed significantly in the past two decades and includes an increasing number of responsibilities. Increasingly, leaders need the requisite knowledge and skills to respond to changes brought about by technology. However, school leaders are often underprepared to support technology-rich environments. In an effort to provide guidance for technology leadership, ISTE developed educational technology standards targeting administrators called NETS-A. Research suggests that these nationally recognized standards should be incorporated in traditional and supplemental leadership development. Since many traditional leader preparation programs have not integrated these skills into coursework, supplemental leader preparation programs have been developed by educational organizations and school districts to bridge the gap between what formal education provides and what is needed for the changing role of the principal. QPLA is one example of a supplemental leadership preparation program.

Given the growing importance of these skills for school leaders we examined how leaders perceive their own skills and analyzed the impact of QPLA training on the development of technology leadership skills.

## **Methodology**

### **Research Design**

The research was guided by the overarching question: What is the perceived technology leadership preparedness level of school administrators as measured by their understanding of the 2009 ISTE NETS-A standards? The following sub-question added clarity:

How do technology leadership preparedness perceptions differ between principals who attended the Quality-Plus Leader Academy and those who did not, across the five NETS-A themes: visionary leadership, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship?

This quantitative study was designed to examine the perceptions of K-12 principals regarding their technology leadership preparedness based on the 2009 NETS-A and the impact of QPLA on those perceptions. In this case, some of the school principals had participated in QPLA and some had not. This study examined an ex post facto treatment

enacted on the participants. Participation in QPLA was the experimental treatment that occurred during the four years preceding this study. Therefore, this study was quasi-experimental (Creswell, 2009).

### **Sample and Sampling**

This study was conducted in a large metropolitan public school district in the southeastern United States. The school district comprised 135 schools and more than 160,000 students. There were 22 high schools, 25 middle schools, 80 elementary schools, and 8 special program facilities. The student demographics were approximately 1% American Indian, 30% African American, 10% Asian American, 25% Hispanic, 5% multiracial, and 30% Caucasian. In addition to being ethnically diverse, the system was socioeconomically diverse with more than 50% of the student population qualifying for free or reduced-cost lunch. The district was chosen based on their use of a nationally recognized leader preparation program, QPLA.

The response rate was calculated by the number of respondents divided by the number of eligible respondents (Fink, 2006). In this study, 134 principals from all school levels were asked to participate. According to Krejcie and Morgan (1970), the number of respondents should be greater than or equal to 97 in order to meet the requirements for a 95% confidence interval. A total of 102 responses were gathered for a 76% response rate, meeting this requirement.

### **Respondents**

An email was sent to all principals in the district of study with a link to the web-based survey. Within one week of the request, 62 principals had responded. After an email reminder, a total of 102 responses were gathered for a 76% response rate. On the survey 57 principals indicated they had participated in the Quality-Plus Leader Academy (QPLA). The respondents who did not participate in QPLA numbered 45. This rate is consistent with the 54% of participants that attended QPLA training district-wide. All survey responses (N=102) were used when compiling descriptive statistics.

An initial review of the responses indicated that 10 participants did not respond to one survey question. One respondent skipped two questions. All other survey responses were complete. The 11 surveys with missing data were excluded in inferential analysis resulting in 91 surveys used for calculations.

### **Instrumentation**

The Center for the Advanced Study of Technology Leadership in Education (CASTLE) developed a statistically validated assessment entitled *The Principals' Technology Leadership Assessment* (PTLA) based on ISTE's 2002 NETS-A (McLeod, 2005). The 2002 PTLA surveyed administrators' participation in several tasks involved in technology leadership. The tasks were developed from 2002 NETS-A, developed by the International Society for Technology in Education (ISTE). In 2009, ISTE updated the NETS-A standards. The overall reliability of the 2002 PTLA instrument is high, with a Chronbach's alpha ( $\alpha$ ) = .95. The 2002 PTLA also exhibited high internal reliability which was neither enhanced nor diminished by removal of individual items (McLeod, 2005).

The 2002 PTLA was the basis for instrument development for this study. With the permission and collaboration of the Center for Advanced Study of Technology Leadership in Education (CASTLE), an updated survey was developed by replacing the 2002 NETS-A standards with the 2009 NETS-A standards. Each survey item was written to operationalize the NETS-A standards (S. McLeod, July 2, 2011, personal communication). The updated PTLA survey utilized the same format by grouping questions based on the NETS-A subscales. An additional demographic question was included in the survey to support the research question based on participation in QPLA. Both surveys used the same rating scale for participant responses. Principals were asked to indicate their perception of preparedness on 21 technology leadership skills. Each question had a 5-point scale where 1 represented *not at all* prepared, 2 represented *minimally* prepared, 3 represented *somewhat* prepared, 4 represented *significantly* prepared, and 5 indicated *fully* prepared. Subscale ratios were calculated to account for variances in the number of questions in each subscale.

The 2009 PTLA survey was piloted to establish content validity and improve questions (Creswell, 2009). The pilot included five school administrators outside the sample population. The survey was revised to improve clarity based on the pilot respondents' feedback.

## **Data Collection**

After procuring approval for the research to be conducted, principals' email addresses were obtained from the district administrator database, which listed every building administrator in the school system. Participants were contacted via electronic mail with a request to participate in the survey. A link to the web-based survey was sent to the sample principals. An additional request for participation was sent seven days after the original request to increase responses.

The survey instrument was an anonymous web-based survey created and accessed through *SurveyMonkey*®. There was no identifying information captured as part of the survey. Survey data was collected through the *SurveyMonkey*® password protected website and exported to Microsoft® Excel. Next, the data was formatted and imported into SPSS 19.0 to generate descriptive statistics and inferential analysis.

### **Data Analysis and Reporting**

Using SPSS 19.0, the first level of data analysis was a table of descriptive statistics including frequency, mean, range, and standard deviation. The descriptive statistics were analyzed for anomalies such as empty survey responses.

The next level of analysis was a multivariate analysis of variance (MANOVA) to evaluate the effect of the independent variable across the five NETS-A subscales: visionary leadership, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship. The independent variable was participation in the Quality-Plus Leader Academy. The dependent variables were the five NETS-A subscales. The results compared the perception of preparedness based on whether or not the principal participated in the leader preparation program. Further analysis using a one-way analysis of variance was performed to reveal any subscale statistical significance.

### **Results**

#### **Perceived Technology Leadership Preparedness**

The results are organized by research question. First, data was analyzed to investigate the perceived technology leadership preparedness level of school administrators as measured by their understanding of the 2009 ISTE NETS-A standards. The first level of data analysis used descriptive statistics for each of the non-demographic survey questions. Each of these questions referenced one of the technology leadership indicators. The number of responses for each question ranged from 99 to 102. *Promote, model and establish policies for safe, legal and ethical use of digital information and technology* had the lowest response rate with 99 out of 102 participants responding. There were seven other questions where one or two respondents did not answer. The remaining 13 indicators were answered by all respondents.

Responses ranged between 2, indicating *minimally* prepared and 5, indicating *fully* prepared for all except two questions. Responses for *ensure instructional innovation focused on continuous improvement of digital learning* ranged from 3, indicating *somewhat* prepared, to 5. *Ensuring access to appropriate digital tools and resources to meet the needs of all learners* had the widest response range of 1 to 5.

For the second level of analysis, each survey question had a possible response mean range from 1, indicating *not at all* prepared, to 5, indicating *fully* prepared, for each of the 21 indicators. The mean range was from a low score of 3.85 on a scale of 5 to a high score of 4.30 on a scale of 5. The lowest ranked mean ( $m = 3.85$ ) was the same for three questions. These were: *facilitate a change that maximizes learning goals using digital resources; promote programs and funding to support implementation of technology – infused plans; and establish and leverage strategic partnerships to support systemic improvement*. The highest ranked mean ( $m = 4.38$ ) was for *promote, model, and establish policies for safe, legal, and ethical use of digital information and technology*. The next highest mean ( $m = 4.3$ ) was for *promote and model responsible social interactions related to the use of technology and information*.

Principals indicated the highest level of preparation on the subscale digital citizenship. Out of a total possible mean score of 20, the subscale scored 16.74 (ratio = .796). The subscale ratio for excellence in professional practice was 20.83 out of 25 (ratio = .790). Digital age learning culture scored 16.03 out of 20 (ratio = .752). The subscale ratio for system improvement was 19.98 out of 25 (ratio = .749). Finally, the subscale visionary leadership scored 11.57 out of 15 (ratio = .714).

Principals indicated they were most prepared for safe, legal and ethical use of technology ( $m = 4.38$ ) as well as responsible social interactions related to the use of technology ( $m = 4.3$ ). The next highest scoring indicator concerned using learning communities to stimulate and support faculty in the study and use of technology ( $m = 4.28$ ).

### **Impact of QPLA on Perceptions**

The second research question focused on whether technology leadership preparedness perceptions differed between principals who attended the Quality-Plus Leader Academy and those who did not, across the five NETS-A themes. This analysis involved descriptive statistics for the five NETS-A subscales: visionary leader, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship related to QPLA participation. Compiling the indicators for each subscale provided a better representation of the constructs of technology leadership. The five subscales had unequal associated indicators that accounted for additional variation in mean scores. Therefore, subscale ratios were included for comparison.

The first subscale, visionary leadership, was determined by three indicators, Question 1 through Question 3. The possible range for the mean of this subscale was 3 to 15. The mean score for QPLA participants was 11.62 versus 11.61 for those who did not participate. The digital age culture subscale was comprised of Question 4 through Question 8 with a possible range of mean scores from 5 to 25. The mean for QPLA participants was 20.80 and 19.47 for non-participants. The third subscale, excellence in

professional practice, had a mean range of 4 to 20 and was calculated using Question 9 through Question 12. The mean score for QPLA participants was 16.95 versus 16.1944 for non-QPLA participants. Systemic improvement, the fourth subscale, with a mean range of 5 to 25 was generated from responses to Question 13 through Question 17. QPLA participants reported a mean of 20.58 compared to non-participants with a mean of 19.22. The last subscale, digital citizenship, included Question 18 through Question 21 with a mean range of 4 to 20. The mean score for QPLA participants was 17.55 versus 15.78 for non-QPLA participants.

Prior to performing inferential analyses, preliminary assumption testing was conducted to check for normality, linearity, univariate, and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. A multivariate analysis of variance (MANOVA) was used to investigate the differences between QPLA participation and perceived technology leadership preparedness level across the five subscales. For this analysis a Wilks' Lambda value of .84 was generated. A Wilks' Lambda value of 1 indicated no difference in the means; therefore, this analysis showed a difference in means. The F ratio calculated for this MANOVA was 3.33. This value indicated that the variability between groups is 3.33 times greater than the variability within the groups. The F ratio of 3.33 exceeded the statistical significance level with alpha level .05. Further analysis showed that the probability of the responses being attributed to chance is 1 in 100 ( $p = .01$ ) or a 1% chance. Finally, the eta square value ( $\eta^2 = .16$ ) indicated that the effect size is large, which further indicated a difference between the QPLA and non-QPLA participants.

With statistical significance being reached, analysis of the individual subscales was performed to determine which subscales differed. An analysis of variance (ANOVA) for each subscale was performed to provide this information. A Bonferroni adjustment generated an alpha level of .01 (.05/5). This adjustment was made to reduce Type I errors that can be generated by repeated ANOVA tests. The subscale with the least variance between QPLA and non-QPLA participants was visionary leadership with an eta square of .00. An effect size of  $\eta^2 = .03$  was calculated for excellence in professional practice. Subscales, digital age culture and systemic improvement, had a .04 effect size. The largest effect size of .10 was for digital citizenship. In addition to a large effect size for digital citizenship, the level of significance,  $p = .00$  rounded from .002, was the only subscale to reach statistical significance of variance. This level indicated that there is no probable chance that the difference between groups is random. Approaching statistical significance was the subscale systemic improvement with a significance level of  $p = .05$ .

To determine if there was a statistically significant difference between QPLA and non-QPLA participants, a multivariate analysis of variance (MANOVA) was performed. Overall, there was a statistically significant difference between QPLA participation on the combined dependent variables,  $F(5, 85) = 3.33$ ,  $p = .009$ ; Wilks' Lambda = .84;

partial eta squared = .16. In all five subscales, QPLA participants reported a higher mean score than principals who did not participate in QPLA.

Once it was determined that there was a statistically significant difference, further analysis was conducted to determine which of the five subscales demonstrated a significant difference. A one-way analysis of variance (ANOVA) was conducted for each of the five subscales. To reduce type 1 errors, a Bonferroni adjusted alpha level of .01 was set for the level of significance. The only subscale to reach statistical significance was digital citizenship,  $F(1, 89) = 9.76$ ,  $p = .002$ , partial eta squared = .10.

## **Results Summary**

The 102 principals perceived themselves to be the best prepared in the area of digital citizenship (subscale ratio = .796). The subscale that principals indicated they felt least prepared was visionary leadership (subscale ratio = .714). For all participants the mean scores on the 21 indicators ranged from 3.85 on a scale of 5 to 4.30 on a scale of 5. These scores reflect a high level of perceived technology leadership preparedness among those who responded to the survey.

There were 57 respondents who participated in QPLA and 45 who did not. A one-way between-groups multivariate analysis of variance was performed to investigate the differences in perceived technology leadership preparedness between QPLA and non QPLA participants. Five dependent variables were used: visionary leadership, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship. The independent variable was QPLA participation. There was a statistically significant difference between QPLA participation on the combined dependent variables,  $F(5, 85) = 3.33$ ,  $p = .009$ ; Wilks' Lambda = .84; partial eta squared = .16. When the results for the dependent variables were considered separately, the only difference to reach statistical significance, using a Bonferroni adjusted alpha level of .01, was digital citizenship,  $F(1, 89) = 9.76$ ,  $p = .002$ , partial eta squared = .10. An inspection of the mean scores indicated that principals who attended QPLA reported slightly higher perception levels in digital citizenship ( $M = 17.55$ ,  $SD = 2.16$ ) than those principals who did not participate in QPLA ( $M = 15.78$ ,  $SD = 3.24$ ).

## **Discussion**

If we take Dewey's statement regarding preparing students for the future at face value we realize that technology will increasingly be a part of the educational experience for children. Considering that a leader who is being prepared today may be leading for the next 20 to 30 years, it seems certain that they will be leading technology rich schools. As such, school leaders must be engaged in activities which prepare them to lead these schools. This research gives some insight into how current leaders perceive their technology leadership skills and how QPLA impacted those perceptions.

## **Technology Leadership Preparedness**

The primary purpose of this study was to evaluate how principals perceived their preparedness for technology integration. This study revealed principals' perceptions of technology leadership preparedness in the following order based on the subscale mean ratio: digital citizenship (.837), excellence in professional practice (.833), digital age learning culture (.801), systemic improvement (.799), and visionary leadership (.771).

Principals reported their highest level of technology leadership preparedness as digital citizenship ( $F(1, 89) = 9.76, p = .002$ , partial eta squared = .10). This subscale called for leaders to ensure equitable access to technology resources. Digital citizenship expected leaders to promote, model, and establish policies that ensured safe, legal, and ethical use of technology. Responsible use of technology and social interactions in a digital environment were also expected. This finding may be the result of the QPLA activities where participants learned about digital citizenship and digital-age culture. These activities explored the impact of social media, federal internet regulations, and technology-infused quality instruction.

This finding was consistent with the results of a study by Hess and Kelly (2007) that indicated leader preparation programs had the highest prevalence of curriculum related to policies, management, and school law. Anderson and Dexter (2005) also reported that 82% of schools had technology and staff development policies in place. The high level of technology leadership preparedness was also found to be in the top half of the subscale scores in a study by Redish and Chan (2007).

Conversely, other studies found skills common to digital citizenship were lacking among administrators. Macaulay (2009) and Grey-Bowen (2010) reported that the social, legal, and ethical issues indicator was the lowest NETS-A subscale score. Garcia (2009) reported that total cost of ownership (TCO) and equity of access were the lowest scored areas for principals which contradicted the findings of this study.

Visionary leadership was identified as the NETS-A subscale with the lowest perceived preparation level by the respondents ( $F(1, 89) = .00, p = .99$ , partial eta squared = .00). This subscale guides leaders to inspire a shared vision with stakeholders to maximize positive instructional change. A visionary leader is expected to advocate technology efforts by committing time and resources to support change. This finding was particularly interesting in that one session specifically targeted technology leadership and vision.

Studies by Levine (2005), Hess and Kelly (2007), and Leonard and Leonard (2006) indicated that technology leadership preparation was lacking in traditional leader preparation programs. Due to this perceived gap, Garcia (2009) recommended more involvement in long-term technology planning for principals.

Additional research supported the finding of visionary leadership as the lowest score. Studies using the 2002 NETS-A showed the subscale for leadership and vision as the greatest professional development need (Grey-Bowen, 2010; Miller, 2008). Redish and Chan's (2007) study of a supplemental leadership program showed that leadership and vision ranked fourth out of the six 2002 NETS-A standards. Next we discuss the impact of QPLA on these perceptions.

### **Quality-Plus Leader Academy Impact**

Differences in technology leadership preparedness perceptions among principals who attended the Quality-Plus Leader Academy (QPLA) and those who did not across the five NETS-A themes were also examined. There was a statistically significant difference between technology leadership preparedness perceptions of QPLA participants and non-QPLA participants ( $F(5, 85) = 3.33, p = .009$ ; Wilks' Lambda = .84; partial eta squared = .16). Further review indicated that for all five subscales, QPLA participants had a higher mean score than non-QPLA participants. Therefore, QPLA participants' perceptions were higher than non-QPLA participants on the five NETS-A subscales. Several of the QPLA sessions included NETS-A standards. Given that professional development activities addressed technology leadership and vision, digital citizenship, digital –age culture, and systemic improvement these findings are to be expected. These findings are also supported by research which suggested that traditional leadership preparation alone is insufficient for today's schools (Hess & Kelly, 2007; Leonard, 2006; Levine, 2005; Mitgang, 2008; Young, 2010). Frequently, principals who had high levels of technology leadership skills credited technology-related workshops for their knowledge (Garcia, 2009). Furthermore, Grey-Bowen (2010) recommended that district and regional educational entities should supplement traditional programs with ongoing professional development related to NETS-A. The findings from this study indicate that this advice is relevant since leaders who participated in QPLA perceived that they were better prepared to lead technologically rich schools than those who had not participated.

### **Recommendations**

This research has implications for Educational leadership faculty and school districts that prepare school leaders. The review of literature suggested that the role of the principals is changing due to increased technology use and leadership preparation in this area is limited in traditional leader preparation programs. The findings of this study also indicate that principals' technology leadership skills have room for improvement. Considering these findings we recommend that Educational Leadership programs align coursework with NETS-A standards to help leaders develop the knowledge and skills necessary to

lead technology rich schools. In addition, school districts should consider using supplemental principal preparation programs that incorporate the NETS-A standards to further prepare their building leaders. Technology leadership skills should be embedded in the standard dimensions of leader development.

While this research examined principals' perceptions of their technology leadership skills and the impact of QPLA on those perceptions, future researchers may consider:

Further study of the NETS-A subscale, digital citizenship to provide better understanding of the divergent study results.

Examination by school level to provide insight about how technology leadership differs among elementary, middle, and high schools.

A qualitative study focused on the causes of higher perceived technology leadership preparedness.

## **Conclusions**

The National Educational Technology Plan calls for transforming education through effective use of engaging technology and suggests that successful implementation relies on strong leadership. Unfortunately, literature has indicated that technology skills are scarcely addressed in formal educational leadership programs and supplemental programs are developing to meet this need.

The findings in this study further solidify the vast body of research indicating that principals are not adequately prepared for leadership in a technology-rich environment. Principals must leverage resources beyond formal leadership preparation to develop technology leadership skills. There is evidence that principals perceive themselves to be better prepared in the area of digital citizenship than the other four NETS-A subscales. However, there is a wide gap to be closed with the remaining NETS-A subscales: visionary leadership, systemic improvement, digital age culture, and excellence in professional practice. Based on these findings, we argue for changing foundational and on-going leadership development to include technology leadership is imperative. The ISTE 2009 NETS-A standards provide a framework for developing these skills. Traditional leader preparation programs, regional education centers, and school districts should include the NETS-A standards in leadership development activities. This is imperative so that leaders are not leading schools that teach today as we taught yesterday and rob our children of tomorrow.

## References

- Anderson, R. E., & Dexter, S. (2005). School technology leadership: An empirical investigation of prevalence and effect. *Educational Administration Quarterly*, 41(1), 49-82.
- Bush, T. (2008). *Leadership and management development in education*. London: Sage.
- Cheney, G. R. (2010). *A new approach to principal preparation: Innovative programs share their practices and lessons learned*. Fort Worth, TX: Rainwater Leadership Alliance.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed method approaches*. Thousand Oaks, CA: Sage Publications.
- Davies, P. M. (2010). On school educational technology leadership. *Management in Education*, 24(2), 55-61. doi: 10.1177/0892020610363089
- Dexter, S. (2008). Leadership for IT in schools. *International handbook of information technology in primary and secondary education*, 20, 541-554. New York: Springer. doi: 10.1007/978-0-387-73315-9
- Fink, A. (2006). *How to conduct surveys: A step-by-step guide*. Thousand Oaks, CA: Sage Publications.
- Garcia, A. (2009). *The development of the elementary principal as a technology leader* (Doctoral dissertation, University of Texas-Pan American). ProQuest.
- Gosmire, D., & Grady, M. L. (2007). A bumpy road: Principal as technology leader. *Principal Leadership*, 7(6), 16-21.
- Grady, M. L. (2011). *Leading the technology-powered school*. Thousand Oaks, CA: Corwin Press.
- Grey-Bowen, J. E. (2010). *A study of technology leadership among elementary public school principals in Miami-Dade county* (Unpublished doctoral dissertation). St. Thomas University. Retrieved from <http://gradworks.umi.com/34/27/3427096.html>
- Hess, F. M., & Kelly, A. P. (2007). Learning to lead: What gets taught in principal preparation programs. *Teachers College Record*, 109(1), 244-274.
- International Society of Technical Educators. (2009). *International Society of Technical Educators National Educational Technology Standards for Administrators*. Retrieved from [http://cnets.iste.org/administrators/a\\_stands.html](http://cnets.iste.org/administrators/a_stands.html)
- Knezek, D. (2009, March 1). *Updating tech standards for administrators* [Web log interview]. Retrieved from <http://www.youtube.com/watch?v=82AtD9frGnM>
- Krejcie, V., & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(608).
- Leithwood, K. A., & Riehl, C. (2005). *What we know about successful school leadership*. Philadelphia, PA: Laboratory for Student Success, Temple University.

- Leonard, L., & Leonard, P. (2006). Leadership for technology integration: Computing the reality. *Alberta Journal of Educational Research*, 52(4). Retrieved from <http://ajer.synergiesprairies.ca/ajer/index.php/ajer/article/view/576/561>
- Levine, A. (2005). *Educating school leaders* (Publication). The Education Schools Project.
- Macaulay, L. S. (2009). *Elementary principals as technology instructional leaders*. (Doctoral dissertation). Retrieved from [http://www.iste.org/Content/NavigationMenu/Research/NECC\\_Research\\_Paper\\_Archives/NECC2009/](http://www.iste.org/Content/NavigationMenu/Research/NECC_Research_Paper_Archives/NECC2009/)
- McLeod, S. (2005). *Principals technology leadership assessment* [Survey instrument and directions]. Center for the Advanced Study of Technology Leadership in Education. Retrieved from <http://schooltechleadership.org/research/projects/ptla/>
- Miller, M. L. (2008). *A mixed-methods study to identify aspects of technology leadership in elementary schools* (Doctoral dissertation, Regent University). ProQuest.
- Mitgang, L. D. (2008). Becoming a leader: Preparing school principals for today's schools. *Perspective*, 1-11.
- Prensky, M. (2010). *Teaching digital natives: Partnering for real learning*. Thousand Oaks, CA: Corwin.
- Redish, T., & Chan, T. C. (2007). Technology leadership: Aspiring administrators' perception of their leadership preparation program. *Electronic Journal of Integration of Technology in Education*, 6, 123-139.
- Reilly, P. (2005). Leadership: Walking the talk. *Technology & Learning*, 20-26.
- Schrum, L., Galizio, L. M., & Ledesma, P. (2011). Educational leadership and technology integration: An investigation into preparation, experiences, and roles. *Journal of School Leadership*, 21(2), 241-261.
- Sykora, C. (2009, March/April). Building ed tech leadership. *Learning & Leading with Technology*, 48.
- United States Department of Education. (2010). *U.S. Department of Education*. Retrieved from <http://www.ed.gov/technology/netp-2010>
- Young, M. D. (2010). From the director: Why not use research to inform leadership certification and program approval? *UCEA Review*, 51(2), 1-3.

Wendy Metcalf ,437 Old Peachtree Rd. NW, Suwanee, GA 30024, Phone: 678-301-6650  
 Fax: 678-301-6523, E-mail: [wendy\\_metcalf@gwinnett.k12.ga.us](mailto:wendy_metcalf@gwinnett.k12.ga.us)

Jason LaFrance , Department of Leadership, Technology, and Human Development  
 PO Box 8131, Statesboro, GA 30460, Phone: (912) 478-5642, Fax: (912) 478-7104  
 E-mail: [jlafrance@georgiasouthern.edu](mailto:jlafrance@georgiasouthern.edu)